

**International Economics**

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**IMPACTS OF COVID-19
ON BANGLADESH ECONOMY:
IS THE POST COVID-19
BANGLADESH ECONOMY RISKY?****Abstract**

In this study, the principal purpose has been to investigate the impacts of COVID-19 on GDP, export volumes, remittance and unemployment of Bangladesh and to forecast these variables for a period of time using econometric techniques. The results show that the loss of GDP, export volumes and remittance of Bangladesh in 2020 will be \$40984.3387 million, \$6540.966 million, \$3941.449 million respectively. In terms of percentage, the loss of GDP is 18.08%, export volumes – 18.08%, and remittance – 19.73% of the total values. The predicted values indicate that the Bangladeshi GDP, export volumes and remittance inflows will fall for 3 years, 2 years and 2 years respectively. Due to COVID-19 outbreak, the loss of world GDP will be 14904846.597 million dollars or 17.07% of the total GDP and will experience decrease for 7 years. Thus, Bangladeshi economy will face downturn for a lesser period than the world. The predicted GDP shows that COVID-19 will result in a decline of Bangladeshi GDP and export volumes until 2021, after which they will have an increase rate of 4.7% and 9.8% respectively. Additionally, prediction of the remittance inflows reveals a

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decline in 2020, but an increase of 6.692% for 2021. It is also concluded that in 2020 global unemployment rate will be increase by 1.36%, while the unemployment rate in Bangladesh will be increase by 58.23%. This indicator for Bangladesh is very high, but it will fall by 18.72% in 2021 and starting with 2022 it will be increasing by 2.47% for a long period of time. Thus, it can be said that COVID-19 will be a big threat for increasing the unemployment rate for a long period of time. The research testifies that the death rate with respect to confirmed cases is statistically significant at any level. Finally, as no economic indicators other than the unemployment rate will be unreasonably affected, the post COVID-19 economy of Bangladesh will not face undue risk.

Key words:

COVID-19; loss of GDP; export volumes; remittance; unemployment; death rate; econometric techniques.

JEL: C12, C13, C23, C32, C33, C51, C52, C53, C54, C55, O11, O50, O57, Q40.

12 Figures, 6 Tables, 11 Formulae, 19 References.

Introduction

It has been observed that any pandemic has multi-dimensional impacts in the world whose effects continue for a long time. Pandemics of the 20th century, namely Asian flu (1957-58), Spanish flu (1918–1920), Hong Kong flu (1968–1969), Swine flu (January 2009, August 2010), Ebola virus (1976 Sudan, 1995–2014 Congo, 2013-2016 West Africa, 2017 Congo, 2018 Equateur Province, 2018–2020 Kivu, 2020 Equateur Province) and zika virus (2015–2016), have resulted in thousands of deaths and have unbalanced the global economy.

In 2019–2020, the global economy suffered from the adverse effects of US-China trade war, the BREXIT and the US presidential election. On account of

these, the IMF had predicted that the global economic growth would be 3.4 per cent. However, COVID-19 outbreak – the disease caused by severe acute respiratory syndrome coronavirus 2 (SARSCoV-2), a novel strain of coronavirus from the SARS species – changed all types of predictions unexpectedly. The world has now entered the 13th month of the COVID-19 pandemic. We have seen that the medical crisis has not only put strain on the healthcare systems, but has become a multi-system game-changer, which poses significant challenges to all countries of this globe. Statistics show an economic contraction the likes of the Great Depression relative to 1930s, accompanied by a sharply unfolding unemployment crisis.

The first report of the disease caused by COVID-19 was recorded in Wuhan (China) in December 2019. The World Health Organization (WHO) declared the COVID-19 outbreak a Public Health Emergency of International Concern on January 30, 2020 and a pandemic on 11 March, 2020. Data on COVID-19 confirmed cases, deaths and total recovery rates is gathered from worldometers.info and crosschecked with the figures of John Hopkins university data. As of December 14, 2020, more than 73.21 million cases of COVID-19 have been reported in over 220 countries resulting in over 1.63 million deaths, of which 0.4923 million cases and 0.007089 million deaths have been reported in Bangladesh.

As of 14th December, 2020, the highest number of confirmed cases is in the USA (23.14% of total COVID-19 cases worldwide), followed by India (13.53%), Brazil (9.46%), Russia (3.66%), France (3.25%), UK (2.55%), Turkey (2.55%), Italy (2.53%), Spain (2.41%), and Argentina (2.05%). The USA has seen highest number of death outcomes (308091 as of 14nd December 2020), accounting for 18.92% of total Covid-19 deaths worldwide. In this regard, most deaths were recorded in Brazil (181946 or 11.17%), India (143746 or 8.83%), Mexico (114298 or 7.02%), Italy (65011 or 3.99%), the UK (64402 or 3.95%), France (58282 or 3.58%), Iran (52447 or 3.22%), Spain (48013 or 2.95%), and Russia (47391 or 2.91%) of the total number of deaths. On the other end of the spectrum, the highest number of recovered cases was in the USA as well, with 19.23% of total recovered cases worldwide. The number of recovered cases for the USA is 9871915. The other countries in the «top 10» include India (9422636 or 18.35%), Brazil (6016085 or 11.71%), Russia (2124797 or 4.14%), Turkey (1631944 or 3.18%), Argentina (1340120 or 2.61%), Columbia (1321469 or 2.57%), Italy (1115617 or 2.17%), Germany (984200 or 1.92%), and Mexico (927754 or 1.81%).

From these results, this study predicts that if corona virus keeps spreading at current rate, the number of new cases is going to increase by 8.6% each day. The data reflecting confirmed cases, death and recovered cases for each continent are presented in Table 1.

Table 1

Continent-wise Covid-19 statistics as of 14^h December, 2020

| | Europe | North America | Asia | Africa | South America | Oceania | Total |
|-----------------|----------|---------------|----------|---------|---------------|---------|----------|
| Confirmed Cases | 19659959 | 19112924 | 18986950 | 2376805 | 11925955 | 46570 | 72109163 |
| Total Death | 454355 | 449899 | 310913 | 56082 | 339339 | 1034 | 1611622 |
| Total Recovered | 9143923 | 11582589 | 17153053 | 2014826 | 10564562 | 33212 | 50492165 |
| GRTC | 3.27 | 4.01 | 2.27 | 3.76 | 3.66 | 2.25 | 3.72 |
| GRTD | 2.13 | 2.27 | 2.02 | 2.49 | 2.93 | 1.86 | 3.35 |
| % of TC | 27.26 | 26.51 | 26.33 | 3.30 | 16.54 | 0.0646 | 100 |
| % of TD | 28.19 | 27.92 | 19.29 | 3.48 | 21.06 | 0.0642 | 100 |
| % of TR | 18.11 | 22.94 | 33.97 | 3.99 | 20.92 | 0.0658 | 100 |
| DRTC(in%) | 1.83 | 3.06 | 1.71 | 2.40 | 3.03 | 2.21 | 2.18 |
| RRTC(in%) | 46.51 | 60.60 | 90.34 | 84.77 | 88.58 | 71.32 | 70.02 |

Source: <https://www.worldometers.info>; Own Calculations.

Note: GRTC – Growth rate of daily total confirmed cases; GRTD – Growth rate of total deaths; % of TC – Percentage of total confirmed cases; % of TD – Percentage of total deaths; % of TR – Percentage of total recovered; DRTC – Death rate to total cases; RRTC – ratio of recovered to total confirmed cases.

Table 1 shows that Europe has the highest number of infected cases with 27.26% of total infected cases. North America is second with 26.51% of total cases followed by Asia, South America, Africa and Oceania. Europe also has the highest number of deaths with 28.19% of total, followed by North America, South America, Asia, Africa and Oceania. Asia has the highest number of recovered cases with 33.97% of the total, followed by North America, South America, Europe, Africa and Oceania. The growth rate of daily total deaths is the highest in South America (2.93%), followed by Africa, North America, Europe, Asia, and Oceania. The global growth rate of daily total deaths is 3.35%. The growth rate of daily confirmed cases is highest for North America with 4.01%, followed by Africa, South America, Europe, Asia and Oceania. The calculated ratio of change of average deaths to total confirmed cases is highest for North America (3.06%), followed by South America, Africa, Oceania, Europe and Asia. Conversely, Asia has the highest ratio of total recovered to the total confirmed cases (RRTC) – 90.34%, followed by South America, Africa, Oceania, North America and Europe. The ratio of recovery to total confirmed cases in Europe is the lowest because to-

tal recovery data of Spain, UK, Sweden and Netherland is not available. That is why the number of all recovered cases in Europe is not conclusive.

The analysis indicates that the developed and wealthier nations are most-affected by Covid-19 although they have better developed healthcare systems than those of low and lower-middle income countries. Theoretically, total confirmed cases and deaths should to be highest in low and lower-middle countries, but in reality, the reverse is true for total Covid-19 affected and death cases. This can be explained by lesser connections to the epicenter of corona virus, differences in testing, or demographic characteristics of the countries.

According to Hisaka et al. (2020) wealthier nations test more prospective cases in each day than poor nations as the latter are less equipped with testing facilities and other relevant logistics. China, India, the US, the UK, Spain, and Italy are closely associated with epicenter of corona virus in globalized economy where connection of African and Asian countries with the epicenter is quite low. Moreover, Africa is geographically remote from the epicenter of corona virus.

Density of population is normally high in a mega-city. Wealthier nations are the home of most megacities where population density is extremely high. Thus, the virus is spread very easily in such situation. On the other hand, countries with vast rural areas can follow social distancing policies and thwart the transmission of corona virus, as density of population in the rural area is lower than in a megacity. Poorer countries are comprised mostly of rural areas where industrialization is also low.

The elderly people are more vulnerable to corona virus. According to World Bank data, the percentage of people over 60 years of age in Asia, Africa, North America, and Europe are 12%, 5%, 21% and 24% respectively. Hence, mortality rates in Europe and North America are higher than in Asian and African countries.

Recently researchers have examined the impact of COVID-19 on various sectors and they have found that unemployment rate is rising because of corona virus outbreak. Specifically, service sector-based economy is suffering the most (ILO, 2020). Today most economies in the world are interconnected. This interconnection assists in spreading the corona virus across the world. Demand for goods and services is decreasing, which results in production cuts and employee termination. Private investment is in the decreasing trend and demand for loans is low. Thus, banking sector is facing difficulties. Oil prices are also falling, and thus, oil-based economy is also suffering. However, tourism, travel, entertainment and aviation industry have suffered most because of movement restrictions and lockdowns. As a result, unemployment rate is increasing swiftly. Forecasts project that the unemployment rate in the world will increase by 1.36% in 2020 due to COVID-19.

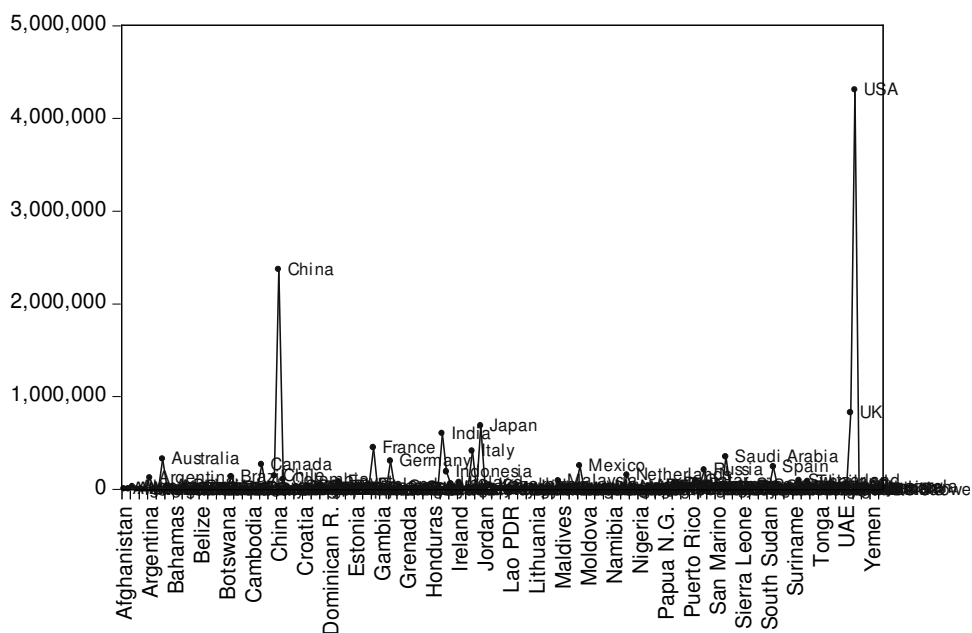
Lockdown, international and domestic travel restrictions seem to be effective measures to stop the spread of corona virus. Now, all countries are facing

the dilemma of whether they should impose lockdown and travel restrictions to save lives because they have negative impact on economy growth. Lockdown along with the loss of lives may result in long-term economic recession.

Covid-19 has contracted GDP of almost every country. It has downed the European economy's GDP by 12.1% in the second quarter of 2020 (Eurostat, 2020). Oxford economists predict that a three-week lockdown covering around 50%-90% of population would cut down the consumption in the next 3 months by 5%-8%. A six-week and nine-week lockdown would reduce the consumption by 9%-16% and 18%-32% respectively. Statistically significant findings state that the average loss of GDP of 178 countries is 83765.17 million USD; on average, the economy of these countries will contract 16.04% of the total GDP; and on average, the economy of these countries will stagnate for 7.67 years. It is also found that the world GDP will contract 17.07% of the total GDP in 2020, while the world economy is projected to stagnate for 7 years due to COVID-19. The GDP loss of 178 countries caused by COVID-19 in 2020 is presented graphically both in million USD and in percentage of total GDP below.

Figure 1

The loss of GDP in million USD (constant 2010 \$)



in four months from March to June. According to the Ministry of Labor and Employment, 8029 factories out of 580836, including 1,915 garment factories have shut down due to COVID-19. As a result, about 1710221 workers have lost their jobs. Thus, the unemployment rate will rise by 2.44% in 2020 due to COVID-19.

Around 164 million have crossed the poverty line in the country due to COVID-19 as per data of the Bangladesh Institute of Development Studies (BIDS). A survey conducted by the International Centre for Diarrhea Disease Research (ICDDR) in Bangladesh has found that 91 per cent of sample families regarded themselves to be financially unstable during the lockdown (March-May, 2020). About 47 per cent of people saw their earnings drop below the international poverty line of Tk160 (US\$1.90) per person per day, while 70 per cent experienced food insecurity and 15 per cent either faced shortage of food, remained hungry or missed meals (FE, August, 27).

It is estimated that 80 per cent of workers in the informal sector have become unemployed. A large number of workers are not able to return to their workplace as many businesses are closing. That is clearly reflected by a very large number of people migrating from urban to rural areas. Notably, a large portion of these temporarily unemployed workers anticipates permanent job loss. As a result of very high levels of unemployment, a very large number of people are already finding it difficult to make ends meet.

The economy of Bangladesh is also facing the prospect of plummeting remittances. It is estimated that the remittances from migrants have declined by a quarter during the pandemic globally. The remittances of migrants constitute about 9 per cent of Bangladeshi GDP. A large number of expertise workers are returning home, exacerbating the deteriorating unemployment situation.

Therefore, a common question raised by the people of Bangladesh is whether the impacts of COVID-19 will be a threat for the Bangladeshi economy. Is the post-COVID-19 economy at risk for Bangladesh? To give answers to these questions, the principal purpose of this study is to determine the impact of COVID-19 on Bangladeshi economy and to predict the post COVID-19 economy of Bangladesh using the econometric techniques based on four economic indicator variables, namely GDP, export volumes, remittances and unemployment rate. The secondary important purpose of this paper is to predict the growth rate of daily confirmed cases and to trace the changes in the ratio of average daily deaths to confirmed cases in Bangladesh. Finally, the paper also aims to define the impact of COVID-19 on socio-economic factors in Bangladesh. The paper is organized as follows: Section II presents a literature review; Section III discusses data sources and empirical models; Section IV discusses social impacts, and section V concludes with a summary of the main findings and policy implications.

Literature Review

Several empirical studies have been conducted to show how pandemics affect the overall economy, for example, Bloom and Sachs (1998) and Hacker (2004) have found that public health has impact on economic welfare and economic growth. Public health is traditionally measured through infant mortality, maternal mortality, life expectancy, and child mortality rate. Public health can affect economic welfare and economic growth in several ways. Costs of illness can be direct (medical costs) or indirect (decrease in patient services due to loss of working hours). Previous studies have found that economic costs of illness are traditionally underestimated in case of deadly diseases that have no vaccine like SARS, AIDS and Influenza.

The experience of earlier outbreaks will help us to predict the implications of COVID-19. Hacker (2004) found that outbreak of AIDS has prompted the government to spend more money on the public health service, for instance on the awareness program, purchasing testing materials, providing support to the AIDS affected people. He found that although AIDS has long-term impact, its effect can be minimized through implementation of preventive measures.

Hyams et al. (2002) found that SARS (previously identified corona virus which was not as deadly as Covid-19) had negative psychological effects. People felt they were at risk during the pandemic even though the chances of dying were very low. Lee and Mckibbin (2003) and Chou et al. (2004) have found that the 2003 SARS epidemic had broader macroeconomic effects. Consumption of products and services had reduced. Costs of business operation had increased, employment level decreased, investment decreased throughout China. The impact of SARS on other economies was based on their susceptibility and their exposure to the SARS virus. Bloom et al. (2005) argued that open economies were susceptible to more risk during any global shock.

In today's globalized economy, no country is safe from the negative impact of COVID-19. Achikoz and Gunay (2020) state that corona virus pandemic negatively affects trade, employment, the financial market, and supply chains. They cannot yet estimate the exact influence of pandemic on the economy as it is still unclear when the pandemic will end. They predict that the corona pandemic may change the current world politic order permanently. This pandemic will shift the trade, manufacturing, health system, production, employment, security policies permanently. They also predict that some countries will benefit from this pandemic and will dominate the world in the post COVID-19 era.

Baker et al. (2020) believe that the economic shock of COVID-19 will be greater in magnitude than the recession of 2008-2009 and similar to the great recession of 1929–1933. Begum et al. (2020) have found that due to COVID-19, dairy farmers, vegetable producers, pharmaceuticals, and poultry farmers are in

deep crisis due to lower prices. In Bangladesh, the pandemic has also seriously affected educational systems, banking, FDI, ready-made garments, remittances, etc.

Bernie (2020) suggests that COVID-19 will force the governments to lose revenues and increase the government spending. He predicts that COVID-19 will reduce consumption and thus government will be unable to collect indirect taxes charged on consumer goods. This study also finds people of higher income range will suffer more economic repercussions than the lower income range.

Lemieux (2020) investigates the impact of COVID-19 on the labor force in Canadian economy. He finds that workers with less bargaining power will be hit harder than those with more bargaining power, thus the existence of trade unions will increase bargaining power. He also projects 32% reduction in the total weekly working hours and 15% reduction in the new employment creation.

Bui et al. (2020) have confirmed that recession caused by COVID-19 affects employment outcomes. Previous research on recession had not find any significant association between recession and employment level, but they have found that unemployment rate for workers aged 65 or above is higher than the unemployment rate for workers aged between 20 and 25 in the USA in April 2020. They have also discovered that unemployment rate for women is greater than the unemployment rate for men of any age group.

Chodorow and Coglianesi (2020) have used simulation approach to predict whether short-term unemployment will persist in the future. They foresee a rise in the unemployment rate in the long run, but estimate that it will be lower than the indicators of the Great Recession of 1929–1933. Coibion et al. (2020) have explored the initial short-term effect of corona pandemic on the employment level. They have found significant reduction in the employment creation, but interestingly, that the unemployment rate is not increasing proportionately, which suggests recently unemployed workers are not looking for a new job. Mai Weems et al. (2020) finds that long term isolation precipitated by unemployment has psychological effects. Unemployment together with isolation increase the rate of suicide.

Gossling et al. (2020) have determined the negative effects of the pandemic on tourism sector. Low paid workers who are engaged in tourism sector suffer enormously. Tourism-based economies are in dire straits due to lockdown and external travel ban. Nuno Fernandes (2020) predicts that countries that depend on service sector more will be affected badly and more jobs are likely to be at risk. He also predicts that uneducated, less skilled and younger employees are more vulnerable in terms of losing their jobs.

A. K. Mohiuddin (2020) has found that per capita daily income of urban slum and rural poor has dropped by 80% due to present countrywide shutdown enforced by the government to halt the spread of Covid-19. 40%-50% of this population took loans to meet the daily expenses in Bangladesh.

Montenovo et al. (2020) reveal that Hispanic workers aged 20-24 and workers with high school degree are the ones losing their jobs most often in the

USA. They also find that job loss is greater for the jobs that require interpersonal interaction, as providing service remotely is not possible.

Ozili Peterson and Arun Thankom (2020) explore the impact of social distancing on stock market and economic activities. This study found that imposed lockdown, restrictions on travel, and restrictive monetary policy significantly lower the stock prices and hinder economic activities. This study also concludes that increase in fiscal spending and absence of internal travelling restrictions have significant positive impact on economic activities. The paper finds no association between the numbers of confirmed COVID-19 cases and economic activities.

Most of the existing studies on COVID-19 qualitatively explain the possible future outcomes of this pandemic. To the best of author's knowledge, there has been no study conducted to predict the post-COVID-19 economy of Bangladesh, the loss of GDP, export volumes, remittance and increase in unemployment rate due to COVID-19, to detect the growth rate of total confirmed cases and the changes in ratio of average daily deaths to total cases of Bangladesh using econometric techniques. Thus, this study shall fill the gap in the literature by empirically exploring the impact of COVID-19 on Bangladesh economy using the econometric techniques. This study will also predict how COVID-19 will change the shape of future economy of Bangladesh using econometric techniques based on the time series data.

Data Collection and Empirical Models

Annual time series data for GDP (constant 2010 \$) from 1971–2019, for export volumes (constant 2010 \$) from 1971–2019 and for unemployment rate from 1991-2019 are collected from the WDI and the data on remittance inflows from 1979-2019 is collected from the Bangladesh Bank in order to determine the impact of COVID-19 on these variables and to forecast these variables for future time periods. Daily time series data for total confirmed cases and total deaths from 1st of January, 2020 to 14th of December, 2020 are collected from worldometers.info in order to calculate the growth rate of total confirmed cases and the changes in the ration of average deaths to total cases in Bangladesh. Due to non-availability of information, some indicators have no data for certain years.

The growth rates of daily cumulative total confirmed cases (GRTC) and deaths for Bangladesh and the world are obtained using the following growth model:

$$TC_t = C_0(1+r)^t e^{\epsilon_t}, \quad t = 1, 2, \dots, T \quad (1)$$

Where:

TC_t are the daily cumulative total cases of the respective variable at time t ,

r is the growth rate of the variable;

ε_t is the random error corresponding to the t^{th} set of observation that satisfies all the usual assumptions.

The estimated value of r is obtained from:

$$\hat{r} = \text{Exp}(\hat{\beta}) - 1, \text{ where } \beta = \ln(1+r) \tag{2}$$

The changes in ratio of average daily deaths to confirmed cases (DRTC) is obtained using the simple linear regression equation of the type:

$$TD_t = \beta_0 + \beta_1 TC_t + u_t, \quad t = 1, 2, \dots, T \tag{3}$$

Where:

TD_t is the number of deaths at time t ;

TC_t is the number of total confirmed cases at time t ;

u_t is the random error term corresponding to the t^{th} set of observation that satisfies all the usual assumptions.

Based on the diagnostic test results, the appropriate econometric models and methods are selected to estimate the ratio of death rate to confirmed cases. The growth rate of total confirmed cases, deaths and the death rate with respect to total confirmed cases are estimated for Bangladesh and also for the world using the software *RATS*. The results are reported below in Table 2.

Table 2

The growth rate of total confirmed cases, total deaths and the ratio of death rate to confirmed cases, per cent

| | Growth Rate of Total Confirmed Cases | Growth Rate of Total Deaths | Death Rate to Confirmed Cases | |
|---|--------------------------------------|-----------------------------|-------------------------------|--------|
| Bangladesh | 3.2451 | 2.3660 | 1.21% | |
| World | 2.4852 | 2.3199 | 1.51% | |
| Dependent Variable Total Deaths: Bangladesh | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prof |
| Constant | 4.1984 | 1.297429 | 3.2360 | 0.0014 |
| TC | 0.0121 | 0.000636 | 18.9897 | 0.0000 |
| Dependent Variable Total Deaths: World | | | | |
| Constant | 1462.763 | 150.0222 | 9.7503 | 0.0000 |
| TC | 0.0151 | 0.000464 | 32.6128 | 0.0000 |

The results show that in Bangladesh the growth rate of daily cumulative total confirmed cases and total deaths are 3.2451% and 2.366%. Meanwhile, for the world these indicators are 2.4852% and 2.3199% respectively. Thus, the growth rate of infected people and deaths in Bangladesh are higher than the world average. It is also found that Bangladeshi average ratio of deaths to total confirmed cases is 1.21%, while the world indicator is 1.51%. Thus, in Bangladesh this indicator is smaller than the world one.

Credible estimation of GDP, export volumes, remittance, and unemployment were chosen the focus because of their significant implications for economic policy-making at the crucial time of COVID-19 pandemic. That is why to predict the loss of GDP, export volumes remittance and increases in unemployment rate, at first these variables are predicted for the year 2020 using the Holt-Winters' seasonal additive method of the type :

$$\hat{Y}_{t+h|t} = L_t + hT_t + S_{t+h-m(k+1)} \quad (4)$$

$$L_t = \alpha(Y_t - S_{t-m}) + (1 - \alpha)(L_{t-1} + T_{t-1}) \quad (5)$$

$$T_t = \beta(L_t - L_{t-1}) + (1 - \beta)T_{t-1} \quad (6)$$

$$S_t = \gamma(Y_t - L_{t-1} - T_{t-1}) + (1 - \gamma)S_{t-m} \quad (7)$$

The predicted value of the variable Y at time t is obtained from:

$$\hat{Y}_t = L_{t-1} + T_{t-1} + S_{t-m} \quad (8)$$

Where:

k is the integer part of $(h-1)/m$, which ensures that the estimates of the seasonal indices used for the forecast come from the final year of the sample;

m is the frequency of the seasonality, i.e. the number of seasons in a year.

The level equation (5) shows a weighted average between the seasonally adjusted observation $(Y_t - S_{t-m})$ and the non-seasonal forecast $(L_{t-1} + T_{t-1})$ for time t . The trend equation (6) is identical to Holt's linear method, which indicates a weighted average between the adjusted level observations and trend rate at time $(t-1)$. The seasonal equation (7) shows a weighted average between the current seasonal index, $(Y_t - L_{t-1} - T_{t-1})$ and the seasonal index of the same season last year.

The equation for the seasonal component is often expressed as:

$$S_t = \gamma^* (Y_t - L_t) + (1 - \gamma^*) S_{t-m} \quad (9)$$

If we substitute L_t from the smoothing equation for the level of the component form above, we get

$$S_t = \gamma^*(1-\alpha)(Y_t - L_{t-1} - T_{t-1}) + (1-\gamma^*(1-\alpha))S_{t-m} \quad (10)$$

which is identical to the smoothing equation for the seasonal component we specify here, with $\gamma = \gamma^*(1-\alpha)$. The usual parameter restriction is $0 < \gamma^* < 1$, which implies that $0 < \gamma < (1-\alpha)$.

Then, the losses in the variable Y which occurred due to lockdowns for COVID-19 are obtained by using the following technique:

$$YL = \frac{Y_{20}}{365} \times \text{Lockdown days} \quad (11)$$

Where:

YL indicates the predicted loss of the variable Y due to lockdowns for COVID-19 in 2020;

Y_{20} is the predicted value of the variable Y in 2020;

Lockdown days is the number of days in lockdown for COVID-19 in 2020.

The *RATS* software is used to forecast the variables of GDP, export volumes, and remittance in 2020, then losses of the respective variables are predicted, as well as the number of years that the respective variable will be in the downward trend. The results are reported in Table 3 below.

Table 3

Values of variables for 2020

| Variable | Predicted loss (in million \$) | Predicted loss in % | Years of economic downturn | Increase in unemployment rate |
|--------------|--------------------------------|---------------------|----------------------------|-------------------------------|
| GDP | 40984.3387 | 18.08 | 3 | |
| Export | 6540.966 | 18.08 | 2 | |
| Remittance | 3941.449 | 19.73 | 2 | |
| Unemployment | | | | 2.24% |
| World GDP | 14904846.597 | 17.07 | 7 | 1.36% |

The results show that the loss of GDP, export volumes and remittance of Bangladesh in 2020 will be \$40984.3387 million, \$6540.966 million, \$3941.449 million respectively. In terms of percentage, the loss of GDP is 18.08%, export volumes – 18.08%, and remittance – 19.73% of the total values. The GDP, export volumes and remittance will stagnate for 3 years, 2 years and 2 years respectively due to COVID-19 in Bangladesh. The loss of world GDP will be \$14904846.597 million or 17.07% of the total GDP in 2020. The world GDP will be effected for 7 years. Due to COVID-19, the unemployment rate will increase by 2.24%, while the unemployment rate of the world will increase by 1.36%. The number of years that the Bangladesh economy will be effected is smaller than the number of years that the world economy will. Additionally, the increase in Bangladeshi unemployment rate will be higher than that of the world. In order to develop the post-COVID-19 economic scenario of Bangladesh and the world, the GDP, export volumes, remittance and unemployment rate are forecasted and are given below in Table 4.

Table 4

Forecasted GDP, export volumes, remittance and unemployment rate for 2020–2030

| Year | GDP | Export | Remittance | Unemployment | World GDP |
|------|------------|-----------|------------|--------------|--------------|
| 2020 | 185671.474 | 29632.558 | 16039.51 | 6.630 | 72433445.243 |
| 2021 | 159156.110 | 28184.499 | 17112.831 | 5.389 | 64392404.090 |
| 2022 | 166706.691 | 30959.910 | 18722.852 | 5.522 | 66474713.933 |
| 2023 | 174615.483 | 34008.624 | 20484.347 | 5.659 | 68624361.132 |
| 2024 | 182899.478 | 37357.553 | 22411.568 | 5.799 | 70843523.231 |
| 2025 | 191576.477 | 41036.261 | 24520.108 | 5.943 | 73134448.190 |
| 2026 | 200665.125 | 45077.223 | 26827.024 | 6.090 | 75499456.663 |
| 2027 | 210184.951 | 49516.110 | 29350.982 | 6.240 | 77940944.350 |
| 2028 | 220156.410 | 54392.107 | 32112.399 | 6.395 | 80461384.421 |
| 2029 | 230600.929 | 59748.258 | 35133.619 | 6.553 | 83063330.024 |
| 2030 | 241540.950 | 65631.846 | 38439.082 | 6.715 | 85749416.871 |

The forecasted values of different variables including the actual values of the previous years are presented graphically below.

Figures 3–7

Forecasts for Bangladesh 2020–2030

Figure 3

Forecast GDP of Bangladesh for 2020–2030

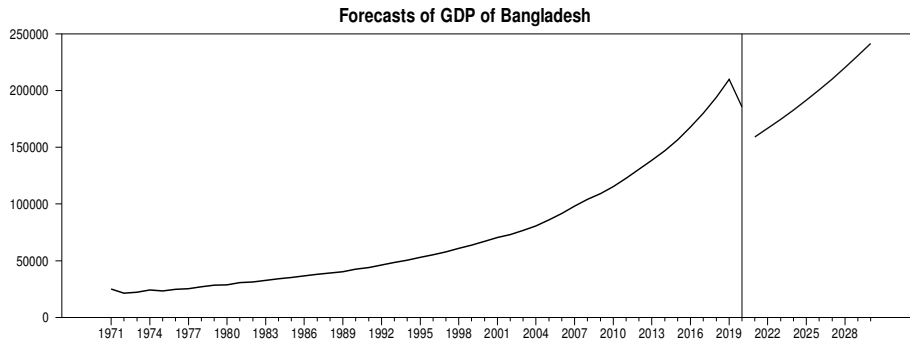


Figure 4

Forecast GDP of the world for 2020–2030

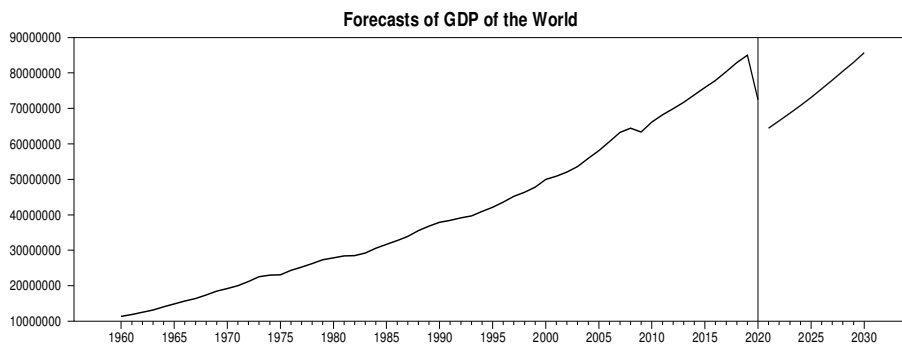


Figure 5

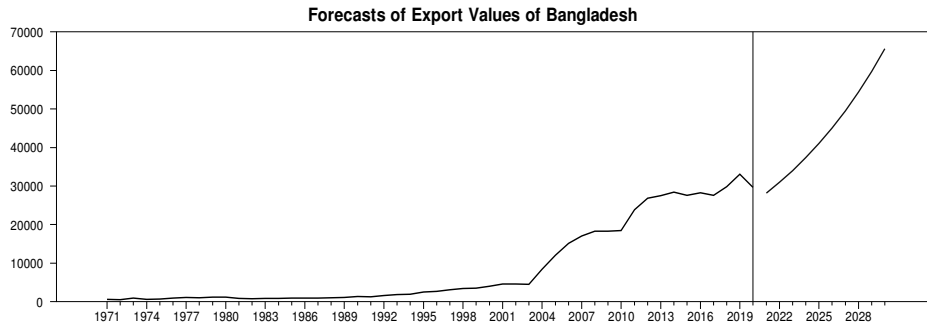
Forecast export volumes of Bangladesh for 2020–2030

Figure 6

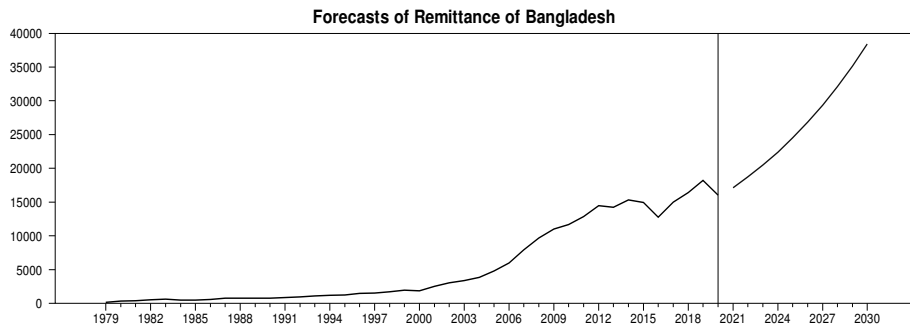
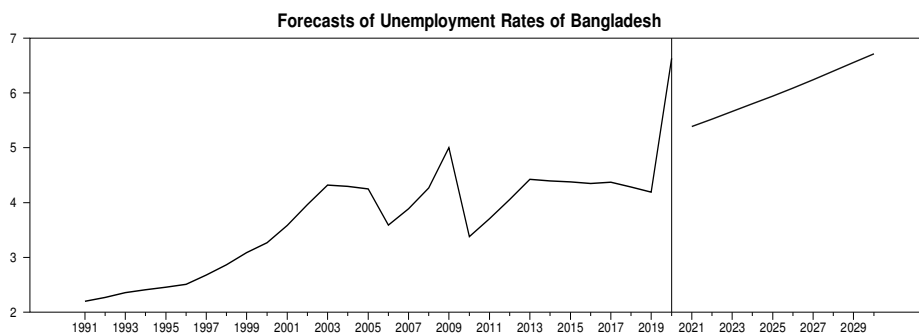
Forecast remittance inflows of Bangladesh for 2020–2030

Figure 7

Forecast unemployment rate for 2020–2030

The forecasted values for the GDP and export volumes will decline until 2021 due to COVID-19 and then will increase again at the rate of 4.744% and 9.847% respectively. Due to COVID-19, the remittance inflows of Bangladesh will decline in 2020 before increasing again at the rate of 9.408%. The unemployment rate of Bangladesh will increase by 58.234% in 2020, but it will fall by 18.718% in 2021 before rising again from 2022 onward with the rate of 2.468%. None of these are good signs for the Bangladesh economy. Therefore, the government of Bangladesh should take necessary actions to control the unemployment rate. Moreover, differentiated stimulation packages should be announced for the vulnerable sectors of the economy. Entrepreneurs should be encouraged and stimulation packages should be allocated for them. This will help to reduce unemployment in the economy. The predicted values of GDP, export volumes and remittance lead to the conclusion that the COVID-19 will not be an insurmountable obstacle for Bangladesh economically and the post-COVID-19 Bangladeshi economy will not be in an unduly risky situation. The growth rates of these variables are also predicted and reported in Table 5 below.

Table 5

The growth rate of GDP, export volumes, remittance inflows and unemployment

| Year | Growth rate of GDP (in %) | Growth rate of export (in %) | Remittance inflows (in %) | Changes of unemployment rate (in %) | Growth rate of world GDP (in %) |
|------|---------------------------|------------------------------|---------------------------|-------------------------------------|---------------------------------|
| 1971 | ---- | ---- | ----- | ----- | 4.343 |
| 1972 | -13.974 | -22.889 | ----- | ----- | 5.725 |
| 1973 | 3.326 | 85.745 | ----- | ----- | 6.505 |
| 1974 | 9.592 | -29.440 | ----- | ----- | 1.993 |
| 1975 | -4.088 | 12.175 | ----- | ----- | 0.601 |
| 1976 | 5.661 | 24.768 | ----- | ----- | 5.271 |
| 1977 | 2.673 | 25.454 | ----- | ----- | 3.934 |
| 1978 | 7.074 | -7.669 | ----- | ----- | 3.893 |
| 1979 | 4.802 | 16.504 | ----- | ----- | 4.125 |
| 1980 | 0.819 | 0.955 | 97.891 | ----- | 1.903 |
| 1981 | 7.234 | -31.767 | 12.514 | ----- | 1.922 |
| 1982 | 2.134 | -4.456 | 38.160 | ----- | 0.432 |
| 1983 | 3.881 | 9.236 | 22.024 | ----- | 2.413 |
| 1984 | 4.803 | -0.945 | -22.051 | ----- | 4.502 |
| 1985 | 3.342 | 7.899 | 0.343 | ----- | 3.711 |
| 1986 | 4.173 | -1.149 | 14.689 | ----- | 3.399 |
| 1987 | 3.772 | 1.900 | 29.765 | ----- | 3.709 |
| 1988 | 2.416 | 10.680 | 2.114 | ----- | 4.619 |

Impacts of COVID-19 on Bangladesh economy:
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| Year | Growth rate of GDP (in %) | Growth rate of export (in %) | Remittance inflows (in %) | Changes of unemployment rate (in %) | Growth rate of world GDP (in %) |
|------|---------------------------|------------------------------|---------------------------|-------------------------------------|---------------------------------|
| 1989 | 2.837 | 8.901 | -0.739 | ----- | 3.678 |
| 1990 | 5.622 | 17.786 | 2.756 | ----- | 2.916 |
| 1991 | 3.485 | -3.092 | 9.089 | ----- | 1.428 |
| 1992 | 5.443 | 21.846 | 11.170 | 3.045 | 1.768 |
| 1993 | 4.712 | 16.393 | 15.261 | 4.102 | 1.529 |
| 1994 | 3.890 | 3.678 | 10.003 | 2.203 | 3.000 |
| 1995 | 5.121 | 30.724 | 1.622 | 1.907 | 3.022 |
| 1996 | 4.523 | 8.075 | 21.228 | 2.116 | 3.389 |
| 1997 | 4.490 | 14.318 | 3.390 | 6.813 | 3.674 |
| 1998 | 5.177 | 12.268 | 11.820 | 6.789 | 2.556 |
| 1999 | 4.670 | 2.251 | 14.280 | 7.754 | 3.248 |
| 2000 | 5.293 | 14.398 | -3.448 | 5.997 | 4.385 |
| 2001 | 5.077 | 14.904 | 32.890 | 9.664 | 1.960 |
| 2002 | 3.833 | -0.164 | 22.423 | 10.541 | 2.182 |
| 2003 | 4.740 | -1.696 | 10.124 | 8.981 | 2.964 |
| 2004 | 5.240 | 85.613 | 14.126 | -0.625 | 4.407 |
| 2005 | 6.536 | 43.001 | 24.793 | -1.002 | 3.915 |
| 2006 | 6.672 | 25.476 | 24.905 | -15.506 | 4.380 |
| 2007 | 7.059 | 12.976 | 31.947 | 8.271 | 4.324 |
| 2008 | 6.014 | 7.081 | 22.420 | 9.748 | 1.853 |
| 2009 | 5.045 | 0.029 | 13.398 | 17.178 | -1.674 |
| 2010 | 5.572 | 0.942 | 6.033 | -32.420 | 4.301 |
| 2011 | 6.464 | 29.339 | 10.241 | 9.648 | 3.140 |
| 2012 | 6.521 | 12.532 | 12.596 | 9.447 | 2.517 |
| 2013 | 6.014 | 2.452 | -1.610 | 9.149 | 2.663 |
| 2014 | 6.061 | 3.201 | 7.651 | -0.700 | 2.847 |
| 2015 | 6.553 | -2.830 | -2.518 | -0.387 | 2.879 |
| 2016 | 7.114 | 2.197 | -14.478 | -0.640 | 2.592 |
| 2017 | 7.284 | -2.343 | 17.324 | 0.506 | 3.262 |
| 2018 | 7.864 | 8.088 | 9.598 | -2.081 | 3.098 |
| 2019 | 8.153 | 10.938 | 10.873 | -2.126 | 2.475 |
| 2020 | -11.574 | -10.360 | -11.895 | 58.234 | -14.775 |
| 2021 | -14.281 | -4.887 | 6.692 | -18.718 | -11.101 |
| 2022 | 4.744 | 9.847 | 9.408 | 2.468 | 3.234 |
| 2023 | 4.744 | 9.847 | 9.408 | 2.481 | 3.234 |
| 2024 | 4.744 | 9.847 | 9.408 | 2.474 | 3.234 |
| 2025 | 4.744 | 9.847 | 9.408 | 2.483 | 3.234 |
| 2026 | 4.744 | 9.847 | 9.408 | 2.473 | 3.234 |
| 2027 | 4.744 | 9.847 | 9.408 | 2.463 | 3.234 |
| 2028 | 4.744 | 9.847 | 9.408 | 2.484 | 3.234 |
| 2029 | 4.744 | 9.847 | 9.408 | 2.471 | 3.234 |
| 2030 | 4.744 | 9.847 | 9.408 | 2.472 | 3.234 |

To get the clear idea about the growth rate of the variables, graphs below were used to illustrate.

Figures 8-12

Forecasts for growth rates of variables

Figure 8

Forecast growth rate of GDP of Bangladesh

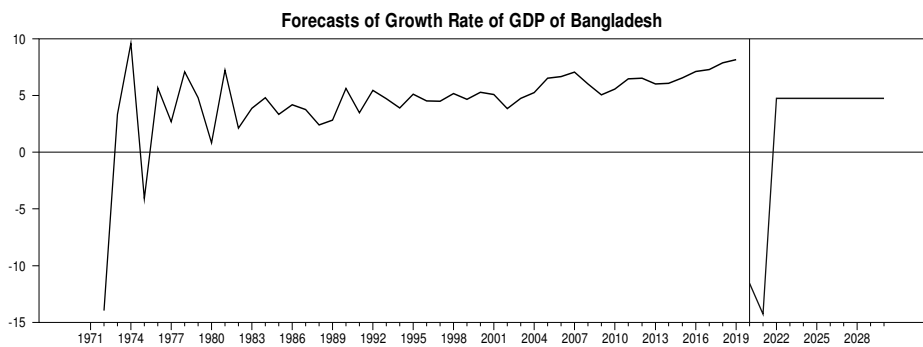


Figure 9

Forecast growth rate of GDP of the World



Figure 10

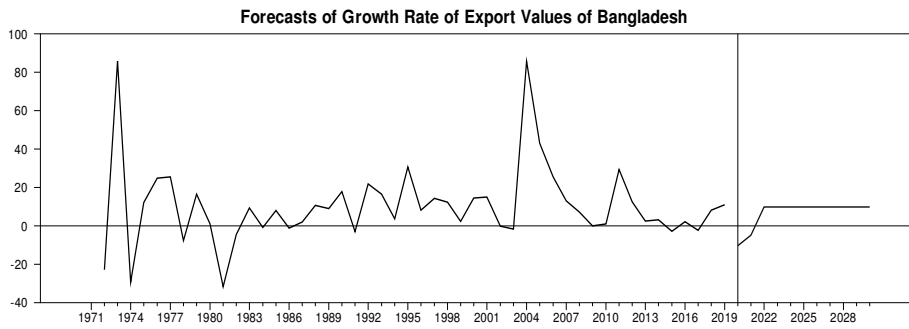
Forecast growth rate of export volumes of Bangladesh

Figure 11

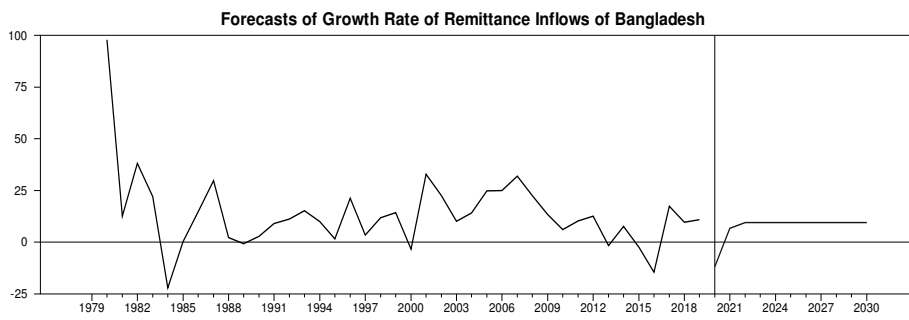
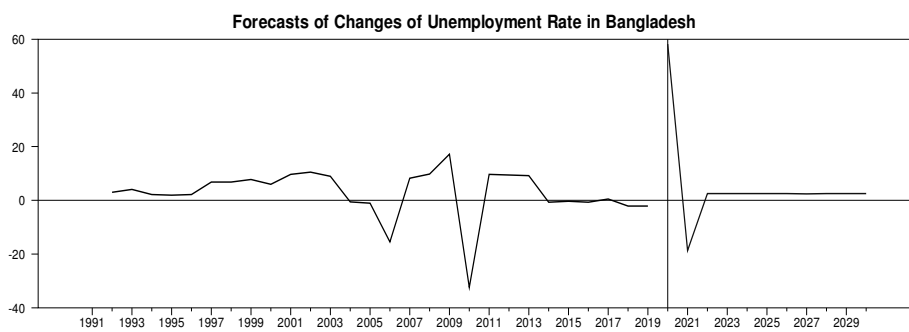
Forecast growth rate of remittance inflows of Bangladesh

Figure 12

Forecast of changes in unemployment rate in Bangladesh

In view of the predicted values, it is clear that the growth rate of GDP in Bangladesh will be negative in 2020 due to the COVID-19 outbreak (-11.57%). The downward trend will continue in 2021 (with -14.28%), but starting with 2022, the growth rate will increase by 4.74%. The trends of the growth rate of world GDP will be the same, with negative -14.78% in 2020 and positive 3.234% in 2021, which is also precipitated by COVID-19.

The growth rate of export volumes will be negative in 2020 with -10.36%, followed by -4.89% in 2021, but the exports will bounce back in 2022 with a 9.847% increase. Due to COVID-19 outbreak, the amount of remittance will contract in 2020 with -11.90% growth rate, but from 2021 it will increase with the rate of 6.92%.

COVID-19's influence will also cause an upsurge of 58.23% in the unemployment rate. The resulting high indicator will fall back somewhat by 18.72% in 2021, with the following increases returning to moderate levels (2.47% in 2022). Thus, it can be said that the effect of COVID-19 outbreak in Bangladesh on the unemployment rate will be large-scale and will have lasting repercussions. This is not a good sign for the Bangladesh economy. Therefore, from now on the government has to take necessary actions to control the unemployment rate in Bangladesh. Excepting unemployment rate, all other indicators of economy considered here will not be affected greatly.

Social Impacts

The COVID-19 outbreak in Bangladesh has had an adverse impact on the society. A large number of people have lost their jobs and livelihoods in Bangladesh due to COVID-19 outbreak. As a result, there has been a rise in all types of social crimes during this time period.

Domestic violence can be verbal, psychological, financial or sexual, caused by the people who live under the same roof or share the same bed. Lockdown's side effect is that people cannot go outside of the house. As per Bangladesh National Women Lawyers' Association (BNWLA), COVID-19 experienced a harsh rise in rape cases. 98 rapes were committed in January, 92 in February, 67 in March, 76 in April, 94 in May and 174 in June. A large number of crimes were not disclosed or reported to the police during the pandemic. Gender discrimination has increased due to COVID-19, which has resulted in unpaid burden of works in household. As women are in inferior position in the labor market, they are more likely to bear the burden of economic disaster due to the pandemic. Violence against women and children has increased dramatically during the pandemic and as shown below in Table 6.

Table 6

Violence against women and children in Bangladesh

| Violence | Before Pandemic October 2019 – March 2020 | During Pandemic April-September 2020 |
|---------------------------------|---|--|
| Women Raped | 555 | 718 |
| Attempts to Rape | 96 | 154 |
| Death after Rape | 31 | 31 |
| Women Murdered by Husbands | 0 | 141 |
| Sexual Harassment against Women | 0 | 115 |
| Children Killed | 297+ | 304+ |
| Violence against Children | 718 | 744 |

Source: Ain O Salish Kendra, Bangladesh.

Before pandemic (October 2019- March 2020) the number of women raped was 555 but during pandemic the number increased to 718, thus during pandemic the frequency of this crime increased by 29.37%. Before pandemic, the number of women who faced the attempts to rape was 96, which increased to 154 during the pandemic, thus during pandemic the attempts to rape have increased by 60.42%. Number of deaths resulting from rape remained at 31. The number of women murdered by their husbands went from zero to 141 during pandemic. Similar change was true for sexual harassment of women, which was not recorded before the pandemic, but reached 115 after. The number of children killed was high before the pandemic – above 297 – but increased even further to over 304 during the pandemic (increased by 2.36%). Occurrences of violence against children before pandemic (October 2019-March 2020) numbered 718 and slightly increased to 744 during pandemic (April-September 2020). Overall, violence against women and children in Bangladesh increased by 32% in last six months. Bangladeshi government has uniformly shut down all educational organizations to control the spread of COVID-19. As a result, education sector has been affected enormously in Bangladesh.

Conclusion and Policy Implications

Therefore, a common question raised by the people of Bangladesh is whether the impacts of COVID-19 will be a threat for the Bangladeshi economy. Is the post-COVID-19 economy at risk for Bangladesh? To give answers to these questions, the principal purpose of this study is to determine the impact of COVID-19 on Bangladeshi economy and to predict the post COVID-19 economy of Bangladesh using the econometric techniques based on four economic indicator variables, namely GDP, export volumes, remittances and unemployment rate.

Research results have found that the GDP loss of Bangladesh in 2020 will amount to \$40984.3387 million due to COVID-19 outbreak, 18.08% of the total GDP and it will be in the downturn for 3 years, whereas the global GDP loss will be \$14904846.597 million (17.07% of the total GDP) and it will be in stagnation for 7 years. The predicted values indicate that COVID-19 outbreak will suppress the Bangladeshi growth rate of GDP to -11.57% and -14.28% in 2020 and 2021 respectively, but GDP will increase with the rate of 4.74% from 2022. The growth rate of the world GDP will be -14.78% and -11.10% in 2020 and 2021, but will recover in 2022 with increasing rate of 3.234%.

Due to COVID-19, the export volumes will decline \$6540.966 million in 2020 (18.08% of the total export volumes), maintaining a downward trend only for 2 years. The growth rate of export volumes will be negative in 2020 with the rate of -10.36%, followed -4.89% in 2021, but it will return to positive dynamics in 2022 with 9.847% growth. COVID-19 has also led to a reduction in the remittance inflows of \$3941.449 million, 19.73% of the total remittance inflows, which will persist for 2 years. Due to COVID-19 outbreak, the amount of remittance will contract in 2020 with -11.90% growth rate, but from 2021 it will increase with the rate of 6.92%.

COVID-19's influence will also cause an upsurge of 58.23% in the unemployment rate. The resulting high indicator will fall back somewhat by 18.72% in 2021, with the following increases returning to moderate levels (2.47% in 2022). Thus, it can be said that the effect of COVID-19 outbreak in Bangladesh on the unemployment rate will be large-scale and will have lasting repercussions. Additionally, the big threat presented by the unemployment rate in Bangladesh caused by COVID-19 will lead to an upsurge in social crimes during the pandemic. Excepting unemployment rate, all other indicators of economy considered here will not be affected greatly. Therefore, from now on the government has to take necessary actions to control the unemployment rate in Bangladesh.

Unemployment conditions can be improved if the following policies are undertaken. Facilitates should be encouraged to work from home through provision of tax benefits. Government should initiate incentives and reskilling programs.

Small trader and sole proprietor enterprise should be provided with unemployment benefits or loans on favorable terms and encouraged not to shut down their business. Both private and public sector should support small business supply chains. Subsidies on wages can be used to safeguard jobs. A comprehensive view must be developed on who needs to retain their jobs or find a new job, identify which jobs are at risk and where demand for extra labor exists. This view will help to divert the additional labor into the sector where more labor is needed. Collaboration between government and private sector to keep people employed and train them is required. A well-designed database can be created for matching job seekers and employer. Upskilling or reskilling the individual in conformance with the need of future in-demand skills. Enhancing digital literacy will help the workers to find jobs in a rapidly changing labor market. Entrepreneurs should be encouraged and stimulation packages should be allocated for them. This will help to reduce unemployment in the economy.

Since the outbreak of COVID-19, Bangladesh economy has been going through a transition period. Thus, in the meantime, government can implement the following policies to recover from the economic crises: increase investment to build skilled human capital, increase investment to cope with changing and more digitized world; emphasize liberal trade policies; inject liquidity into the market, thus increasing the ability of financial institutions to disburse more money allowing people to spend more.

To save the lives, emphasis should be given to increasing the awareness of people regarding the use of protective measures like using masks, sanitizing, maintaining social distancing, and washing hands using soap frequently.

Emphasis should be placed on agricultural sector as it is the primary sector and Bangladesh is well positioned with agricultural products like rice, jute, fishes, vegetables and so many other products, so it should focus on exports of agricultural products to revive the economy. Different stimulation packages should be announced for the vulnerable sectors of the economy.

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